

# A Combinatorial Research on Inverse Semigroups

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ABSTRACT: The theory of Möbius functions and the theory of inverse semigroups hold special places in mathematics. These two theories have no apparent connection. Our following results lead to a combinatorial research on (combinatorial and locally finite) inverse semigroups via Möbius functions and division categories:

*“A reduced standard division category  $C_F(S)$  of an inverse monoid  $S$  is a Möbius category if and only if  $S$  is combinatorial and locally finite”*

*“The Möbius function  $\mu$  of the Möbius-division category  $C_F(S)$  is given by*

$$\mu(s, e) = \mu_E([s^{-1}s, e]),$$

*where  $\mu_E$  is the Möbius function of the locally finite partially ordered set  $(E(eSe), \leq)$ ”*